MAPPING
THE
WORLD
OF
EDUCATION

THE
COMPARATIVE DATABASE SYSTEM (CDS)

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VOLUME ONE

OVERVIEW, DESCRIPTION, AND CODING STRUCTURE

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Introduction[1]

The Comparative Database System (CDS) provides a means for coding and using data on U.S. and international postsecondary educational activity and behavior. CDS permits education data users, including researchers, policymakers, and the public, to obtain accurate and reliable comparative data on postsecondary educational questions such as the flow of students through educational systems, the level of education attained, the type of subjects studied and programs completed, the characteristics of students and institutions, and the detailed geographical patterns of student migration.

Mapping the World of Education: The Comparative Database System (CDS) contains a discussion of the development of CDS, a detailed technical description of CDS and its relation to other international and comparative databases and systems, and advice regarding its use.

CDS is a product of a joint research project between the U.S. Department of Education and the National Science Foundation. While developed specifically to support the Survey of Earned Doctorates (SED) and related surveys, the data coding system described in this publication has other possible applications and may be used whenever comparative and international institutional or individual data need to be organized and analyzed. CIDS is adaptable for autocoding procedures and is the standard system used by the National Science Foundation (NSF), the National Research Council (NRC), and the Bureau of the Census (BC) for collecting, analyzing, and publishing comparative and international data at the federal level.[2] It is being implemented, as of the 1995–1996 academic year, for the Survey of Earned Doctorates (SED). CDS supersedes previous coding systems used to report and analyze comparative and international data collected via SED.

The Utility and Importance of Comparative and International Data

The United States Government undertakes a wide variety of domestic and international activities that make use of, generate, or are dependent upon comparative and international education data.

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[1] The author of this manual is E. Stephen Hunt, a senior research analyst in the Higher Education and Adult Learning Division of the Office of Research. He is also the author of the companion volume *A Guide to the International Interpretation of U.S. Education Data: CIP, CCD, IPEDS and ISCED* (Washington: U.S. Department of Education, 1992); and is a co-author of the *Classification of Instructional Programs: 1990 Edition* (Washington: U.S. Department of Education, 1991).

[2] The National Research Council (NRC) is an independent scientific advisory organization comprising the National Academy of Sciences (NAS), National Academy of Engineering (NAE), and the National Institute of Medicine (NIM). NRC serves as the contractor for conducting the annual SED survey and maintaining the database. The contract is let by the National Science Foundation (NSF), a federal agency, on behalf of itself and four cognizant agencies: the U.S. Department of Education (USED), U.S. Department of Agriculture (USDA), National Endowment for the Humanities (NEH), and National Institutes of Health (NIH — a branch of the U.S. Department of Health and Human Services).

Among the important reasons for these activities are the following:

- Supporting research and policy-making related to educational reform and improvement in the United States, including the National Education Goals pertaining to mathematics and science education and to adult literacy and lifelong learning);

- Studying education developments around the world insofar as these affect American competitiveness in the global economy and inform American practice, including research and development activities, workforce preparation and continuing development, and educational standards and quality;

- Providing accurate data concerning international student flow patterns regarding foreign students who come to the United States to study as well as Americans who pursue education abroad;

- Facilitating the exchange of educational data in mutually useful formats under the auspices of extant treaties, agreements, and arrangements, both formal and informal; and

- Developing a deeper understanding, from a cross-national perspective, of the interrelationships among educational, social, civic, and public policy and economic issues.

Supporting these research missions and policy goals requires accurate information on educational institutions and systems as well as student characteristics and experiences. Since most temporary student migration and exchange[3] occur at the postsecondary educational level, it is particularly important to insure that this level of education is adequately studied.

The Global Education Marketplace

Few countries in the world are as extensively involved in international education as is the United States. Americans involved in this global exchange and the foreign students, employers (U.S. and overseas), and governments that participate have been aware of something that has only recently engaged public attention: the reality of a global marketplace for talent and knowledge.

[3] Temporary student migration and exchange are terms referring to individuals who pursue educational opportunities outside their home country, usually by means of a temporary student visa or as part of a bilateral or multilateral academic exchange arrangement. Temporary student migration and exchange may be contrasted with immigration, where a person who may have been educated elsewhere seeks permanent residency or citizenship in the host country. Comparative education research is applicable to both types of situations.

Students who come to the United States from overseas generally fit into one of three statistical classifications based on residency status: *immigrants*, who enter with the intention of becoming U.S. citizens; *resident aliens*, who obtain permission to settle permanently in the United States and seek employment, and who may or may not eventually seek U.S. citizenship; and *nonresident aliens*, who enter the United States for a limited amount of time and for a specific purpose, such as education, and who do not intend to settle permanently or apply for citizenship. Immigrants are not usually counted as part of the foreign population except in studies of population origins. Resident aliens are sometimes counted as part of the foreign student population depending on the scope of a particular study. If, for example, the study aims to include every student who is not a U.S. citizen, then resident aliens and nonresident aliens will be counted. Usually, however, analyses concentrate on foreign students (non-U.S. citizens) who will not stay in the country permanently, and thus most statistics on the foreign student population refer to the nonresident alien classification.[4]

Even under the narrowest interpretation, the size and scope of U.S. involvement in the global education marketplace are large. As of 1991, 2,543 American community colleges, 4-year colleges, and universities (out of a total of 3,559 higher education institutions) reported the enrollment of one or more nonresident alien students.[5] These numbers mean that in 1991 some 71.5 percent of all U.S. degree-granting postsecondary institutions hosted such students. The 1991 data show that in that year 416,400 foreign students were enrolled out of a total enrollment of 14,359,000, or just under 3 percent of the total (2.9 to be exact). However, this proportion differs significantly at different educational levels. Two-year postsecondary institutions enrolled only 73,500 foreign students in 1991, a number representing 1.3 percent of all community and junior college enrollees. Foreign students represented 2.4 percent of all undergraduate enrollees at 4-year institutions in 1991 (160,100 out of 6,787,400); and 2.1 percent of enrollees in first-professional degree programs and institutions (5,800 out of 280,500). By comparison, foreign student enrollment in graduate schools in 1991 (master's, specialist, and doctoral degree programs) equaled 10.8 percent of all graduate students in the United States (177,000 out of 1,639,100). The numbers and percentages for foreign enrollments have been increasing over the years and may be expected to continue to do so in the near future.

The majority of these foreign degree-earners are graduate students, and the majority of them complete programs in the science and engineering disciplines. More than 26,000 bachelor's degrees, 34,000 master's degrees, and 11,000 research doctorates are being awarded to non-U.S.

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[4] In this volume the terms "nonresident alien" and "foreign" are used synonymously.

[5] The numbers refer to institutions of higher education offering programs leading to postsecondary degrees, not to all U.S. postsecondary institutions. For example, the total number of U.S. postsecondary institutions included in the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS) statistical universe as of academic year 1991–92 was 9,983; 3,601 degree-granting higher education institutions and 6,382 other institutions offering nondegree instruction. See Thomas D. Snyder and Charlene M. Hoffman, *Digest of Education Statistics: 1993* (Washington: U.S. Department of Education, 1993), Table 232: "Institutions of Higher Education, by Control and Type of Institution: 1949–50 to 1992–93," p. 240, and Table 347: "Number of Noncollegiate Institutions Offering Postsecondary Education, by Control and State: 1991–92 and 1992–93," p. 350.

citizens each year.[6] Among the recipients of U.S. doctoral degrees in 1992, the most recent reporting year, awards to non-U.S. citizens accounted for 30.5 percent of the total of 11,846 degrees, with resident aliens comprising 5 percent and holders of temporary visas (nonresident aliens) 25.5 percent. These foreign graduates obtained 40.2 percent of all U.S. doctorates in the physical sciences, 42.1 percent of all engineering and applied sciences doctorates, 24 percent of all life sciences (biological, health, and agricultural sciences) doctorates, 12.5 percent of all social and behavioral science doctorates, 19.5 percent of all humanities doctorates, and 17.8 percent of all professional (education, business, other fields) doctorates.[7] In other words, degree awards to foreign students account for over 10 percent of every broad subject matter category at the doctoral level, including one-fifth of all humanities degrees, over one-tenth of all social and behavioral sciences degrees, one-fourth of all life sciences degrees, and nearly one-half of all physical science and engineering degrees.

Available data also show that the United States sends a large and growing number of its citizens to study overseas. For 1991, data published by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) revealed that 25,071 U.S. citizens were enrolled in overseas programs leading to a degree or other award. The 10 host countries accepting the largest numbers of degree-seeking U.S. citizens were the United Kingdom (5,401), Germany (4,207), France (4,207), Canada (2,972), China (1,377), Japan (941), Australia (626), Republic of Korea (536), Spain (532), and Italy (512). Unfortunately, data are not currently available on the number of these migratory American students who earn foreign awards each year, or the proportion who complete the programs in which they enroll. There is no doubt, however, that the number of U.S. citizens enrolling in foreign degree programs has been increasing. Data reported to UNESCO in 1981 indicated that 19,692 Americans were enrolled in degree programs in foreign institutions. The 1991 number therefore represented a 21.5 percent increase over the 1981 data.[8]

In addition to Americans enrolled in foreign programs leading to completion awards, an even

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[6] J. G. Huckenpöhler, *Foreign Participation in U.S. Academic Science and Engineering: 1991*, Special Report NSF 93-302, Surveys of Science Resources Series (Washington: National Science Foundation, February 1993), pp. 5–30. Comparable figures reported by the National Center for Education Statistics (NCES) differ slightly due to differences in survey methodology and date of data collection during the academic year. The Program Completions Survey conducted as part of the IPEDS system of surveys reported more than 29,000 bachelor's degrees, 36,000 master's degrees, and 9,700 doctoral degrees earned during the 1990–91 academic year. See *Digest of Education Statistics: 1993*, Tables 255, 258, and 261.

[7] Paula Ries and Delores H. Thurgood, *Summary Report 1992: Doctorate Recipients from United States Universities* (Washington: National Academy Press, 1993), Appendix Table A-3, pp. 52–53.

[8] UNESCO, *Statistical Yearbook/Annuaire statistique/Anuario estadístico 1993 and 1984*, (Paris: United Nations Educational, Scientific, and Cultural Organisation, 1993 and 1984), Tables 3.15 (1993) and 3.16 (1994). The data reported to UNESCO refer only to students who would be classified as nonresident aliens (nonpermanent foreign residents) in the United States, and in general only to those enrolled at university-level institutions. While the tabulations are for data pertaining to 45 (1984) and 50 (1993) selected countries, UNESCO notes that the totals given nevertheless account for approximately 95 percent of the world total.

larger number participate in study-abroad programs. Such programs do not lead to foreign postsecondary awards and usually do not earn foreign academic credit. Most study-abroad programs are organized by American colleges, universities, or educational organizations[9] and last from a few days to a year, and may result in academic credit recognized by a U.S. institution. A smaller number of such programs arrange for participating students to enroll directly in foreign institutions and then award credit for the experience upon the students' return, while a few make other arrangements. The Institute for International Education (IIE) reported that 62,341 U.S. citizens were enrolled in study-abroad experiences for credit during the academic year 1987–1988.[10] This number includes only students who received U.S. academic credit (the total of all Americans going abroad for credit and noncredit experiences is unknown but undoubtedly higher).

The above examples help to demonstrate that the global education marketplace is very much a two-way street. This pattern of international migration, exchange, and interdependency is likely to intensify rather than decline.

The size of the global sector of American postsecondary education has important economic and policy implications. These include

- The emergent demographic dominance of some program fields, such as various engineering specialties, by foreign students, a phenomenon with supply and demand implications for the U.S. job market;

- The economic importance of international student migration to U.S. postsecondary institutions and their sponsors (including State governments), as signified by the size of the foreign student population, the income derived therefrom, and the amount of faculty, program, and facilities support thus provided;

- The importance of providing opportunities to study in the United States as an instrument of U.S. foreign policy, evidenced in part by the funds devoted to sponsoring U.S. study by Federal agencies[11];

[9] Study-abroad and exchange programs for secondary (high school) students also exist, but these are beyond the scope of this study.

[10] IIE/Zikopoulos, *Open Doors*, 1988, pp. 80–83.

[11] Summary budget figures for major Federal assistance programs wholly or largely devoted to international educational exchange may be found in: *Budget of the United States Government: Fiscal Year 1994*, 103rd Congress, 1st Session, House Document 103-3 (Washington: Office of Management and Budget, 1993), FY 1992 Actual Expenditures. A listing of all Federal programs involved with exchanges appears in: Advising, Teaching, and Specialized Programs Division, *Directory of Resources for International Cultural and Educational Exchanges* (Washington: U.S. Information Agency, 1992). Major public and privator sector support and leadership resources in international exchanges are listed in: Jynks Burton, Ed., and Foster K. Tucker, Principal Ed. Consultant, *International Exchange Locator: A Guide to U.S. Organizations, Federal Agencies, and Congressional Committees Active in International Educational Exchange* (New York: Academy of Educational Development/IIE Liaison Group for International Educational Exchange, 1991).

- The growing importance of the flow of U.S. students abroad, including such issues as the reasons for outmigration, the quality and kind of knowledge and skills they bring back, and potential "brain drain" developments; and

- The benefits realized from international educational exchanges to the United States, including increased goodwill and contacts, cross-fertilization of learning and research, enhanced reputation, the acquisition of highly productive new residents and citizens, and improved competitive position in the global economy.

Studying and tracking this activity is important to the national interest, especially in the context of the National Education Goals and intense interest in both educational and economic reform.

The Relevance of Comparative Background Data to Current Issues

Background data on the education of U.S. and non-U.S. students who study in America, and the institutions they have attended and the programs they have completed, help to answer several important research and policy questions.

- When do students complete secondary education and begin postsecondary studies?

- What types of postsecondary credentials do students earn, from what types of institutions and in what fields?

- How long do postsecondary studies of different types take to complete, and how long do students from different backgrounds and with different academic histories take to complete them?

- Where do students who migrate, both intra- and internationally, come from, where have they studied before, and where do they go to seek further education?

- Do students change their fields of study as they progress and, if so, are patterns evident in relation to different majors, future plans, or other characteristics?

- Do the postgraduation employment plans of students bear any association to their backgrounds and academic histories?

- What are the sources of support for students, the pattern and distribution of that support across space (programs, institutions, and countries) and time (over the years), and are these resources being used effectively?

- What other patterns are revealed from the data?

Answers to these questions are generally available for students who have begun and completed their entire educational experience in the United States and in other countries. They are not often available from a comparative perspective, however, and especially not for the growing number of students who migrate internationally during their academic careers. It is important to fill this knowledge gap for three reasons.

1. The United States hosts a large and growing number of foreign students, especially at the graduate level, whose academic backgrounds deserve studying. The number of such students is now nearly one-third of all students completing research doctorate programs in the United States.

2. The presence of a significant number of foreign students engaged in educational programs that are identical to those pursued by U.S. citizens provides a unique opportunity for comparative analysis of educational backgrounds and how these may influence educational outcomes.

3. International student migration is increasingly a two-way street, with growing numbers of Americans studying abroad in addition to the many foreign students who study in the United States. Data on migrating students are needed in order to assess this important international development and to promote the exchange of information between donor and host countries.

An opportunity to answer the research questions stated above exists in the form of the Survey of Earned Doctorates (SED), an annual census of U.S. and foreign graduate students who earn research doctorate degrees at U.S. universities, and the related Survey of Doctorate Recipients (SDR), an annual follow-up survey of U.S. doctorate recipients one year after completing their degrees and entering the workplace. As this report shows, SED provides researchers, policymakers, and the public with a rich source of information on the background, experiences, and future plans of these students.

Providing a Useful Comparative Database

Data collected via SED on foreign respondents' academic backgrounds ceased to be regularly encoded in 1968. The data were partially coded from that year until 1974, when encoding ceased altogether. Incomplete and irregular attempts to update the foreign institution code listings have been made since that time, usually targeted at specific countries that have shown significant increases in the numbers of their citizens coming to the United States to study. Because all of the raw data collected since 1967 are retained on microfiche, they are not lost. What has been missing until now are the recognition that these unique data are important to the

nation and the means for making them available to researchers and policymakers in an accurate and useful form.

The database system used prior to the cessation of international data coding in 1974 was unsatisfactory for a variety of reasons and is now obsolete. That system coded data on U.S. students and institutions separately from data on foreign students and institutions, making comparisons difficult and expensive. It was a limited system that provided data on relatively few non-U.S. institutions and no data at all on institutional characteristics. The proliferation of new institutions, changes in educational systems and to the political status of countries, changes in student migration patterns, and increased knowledge since the late 1960s and early 1970s render the old database system inadequate for current and future applications. Occasional efforts to update portions of the old system were made, but these efforts — especially in regard to foreign data — were intermittent.[12]

An intensive review of data needs has led the National Science Foundation and the U.S. Department of Education to replace the old database system and to develop CDS in order to do so. The cessation of most international data coding, and the technical problems connected with the system and procedures used until now, have prevented SED from being used as a comparative research tool and thus realizing its full potential. SED is one of the few U.S. databases that covers both U.S. and foreign students in isolable and comparable detail. It includes statistically significant cohorts of both foreign and domestic individuals from different backgrounds who are engaged in the same educational experience, in the same system, at the same time. Background data are collected for all respondents. All that is needed to take advantage of this research opportunity is a valid and reliable way to record and analyze the data. That is the task which CDS is designed to accomplish.

In addition to supporting SED, CDS is adaptable to a wide variety of additional uses where comparative and international data are concerned. CDS provides

1. A complete coding structure for all known countries of the world, subdivisions of major countries, and chief locations (cities and towns) of postsecondary educational activity;

2. A complete coding structure for all known secondary and postsecondary degrees, diplomas, and certificates of every national education system, linked to both the International Standard Classification of Education (ISCED) and prevalent recognition practice among U.S. institutions;

[12] Office of Scientific and Engineering Personnel (OSEP), *Codes for Educational Institutions in the United States and Possessions*, (Washington: National Research Council, no date); OSEP, *Codes for Educational Institutions in Foreign Countries*, (Washington: National Research Council, September 1989); OSEP, *Survey of Earned Doctorates Questionnaire Coding Manual*, (Washington: National Research Council, unpublished/annual); and OSEP, *Tape Documentation File: 1920-1990 Doctorate Records File*, (Washington: National Research Council, September 1991). NAS/NRC uses SED data to track research fellowship holders, hence the historical presence of nondegree-granting organizations in the institutional database. These organizations approve travel arrangements and/or sponsor fellows.

3. A complete coding system for educational programs; and

4. A complete coding structure for all known postsecondary institutions throughout the world, including pertinent data about institutional type, level, location, and primary language of instruction.

United States data are included in CDS as well as foreign data, thus making possible direct statistical comparisons. This system will, for example, permit access to specific comparative data on topics such as teacher education, vocational and professional education, secondary school qualifications, subject-specific questions, and scientific and technological education. When used together with survey data such as that provided via SED, the system permits analysis of flow patterns, trends, persistence, program completions, linguistic capabilities, migration, changes in subject, financial support, outcomes, and career plans on a cross-national basis.